이류체 노즐에서의 액적크기측정 및 다공성 실리카 합성

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The morphology of particles is important for their applications and is dependent on the initial droplet size at the spray drying method. The relationship between the precursor droplet size at a two-fluid nozzle and the silica particle morphology synthesized by flame spray pyrolysis (FSP) was elucidated. Size distribution of droplets from the two-fluid nozzle with an external mixing was measured by a laser diffraction method. Scanning electron microscopy (SEM) was used to characterize particle morphology. As the solution flowrate and the height from the nozzle tip increased, Dv50 increased due to the largely formed droplets and the collisions of droplets, respectively. As the dispersion air velocity and flowrate and the ethanol fraction increased, Dv50 decreased due to the increased external pressure force and the lower surface tension, respectively. The dispersion air velocity was the most effective factor to control the droplet size. Spherical submicrometer-sized silica particles with micropores were formed at the mean droplet size of 5.6 μm and the silicic acid concentration of 0.0531 M. Spherical silica particles were synthesized from the smaller droplets with silicic acid. Irregular shaped and toroid particles were obtained from the larger droplets. Longer time of momentum transfer and faster evaporation rate of the droplets resulted in a nucleation and condensation of solutes while the droplets oscillate.